Everything Is Black Holes: A New Theory of Everything for the Rest of Us

If you wanted to simulate an entire universe on your computer — every particle, every force, every galaxy from the Big Bang to the last dying star — you would need one thing above all else: the correct theory of everything. Not an approximation. Not a model that works in some regimes and breaks down in others. The real thing, simple enough to compute, complete enough to leave nothing out.

Physicists have been searching for that theory for a century. They have come extraordinarily close. Two frameworks — quantum field theory, which describes the subatomic world with breathtaking precision, and general relativity, which describes gravity and the large-scale structure of the cosmos — each work perfectly in their own domain. The problem is that they are fundamentally incompatible. Every attempt to combine them produces mathematical nonsense: infinite answers where there should be finite ones, probabilities greater than one, energies that blow up without bound. String theory tried to resolve this by proposing that all particles are tiny vibrating strings in ten or eleven dimensions. Loop quantum gravity tried by weaving spacetime itself into discrete quantum loops. Both are mathematically elaborate, experimentally untested, and — crucially — too complicated to simulate on any computer that exists or is likely to exist.

This document proposes a different path. Not a new theory invented from scratch, but a recognition that the theory we already have — written down correctly, in the right coordinates — already contains the unification we have been looking for. The fix is not adding new mathematics. It is choosing the right address for the mathematics we already possess.

The Problem With Coordinates

General relativity describes gravity as the curvature of spacetime. Mass bends space and time around it, and other objects follow the curves. This picture is geometrically beautiful and experimentally confirmed to extraordinary precision. But it comes with a cost: the equations are nonlinear. Nonlinear means that two solutions cannot simply be added together to get a third. In practice, this means that simulating even two black holes merging requires months of runtime on supercomputer clusters — because at every

step of the simulation, the curvature of spacetime produced by each black hole changes the background that the other black hole is moving through, and all of that has to be recomputed continuously from scratch.

There is, however, a coordinate system — discovered in 1963 by Roy Kerr and given its full mathematical treatment in a 1975 paper by Gurses and Gursey — in which something remarkable happens. In these Cartesian Kerr-Schild coordinates, the metric of spacetime takes a special form: flat Minkowski background plus a small correction term that is exactly linear. Linear means addable. Linear means that you can take the gravitational field of one black hole and simply add the gravitational field of another, and the sum is the correct solution for both together. The superposition principle — which we take for granted in electromagnetism and quantum mechanics but which general relativity normally forbids — becomes exactly valid.

This is not an approximation. It is not a weak-field limit. It is exact. And it has a consequence that changes everything.

What a Black Hole Really Is

In Kerr-Schild coordinates, a rotating black hole is not described by specifying the curvature of spacetime at every point in a four-dimensional manifold. It is described by two numbers — its mass and its spin — and a position and velocity in flat space. That is it. The entire gravitational field of a rotating black hole is encoded in those few parameters, moving through a flat Minkowski background, exactly as a particle moves through space in special relativity.

Now look at what quantum mechanics tells us about fundamental particles. An electron is described by two numbers — its mass and its spin — moving through space. The spin of an electron is $\hbar/2$, a specific quantum of angular momentum. The mass of an electron is 9.1×10^{-31} kilograms. These are invariant properties: they do not change regardless of how fast the electron is moving or what reference frame you observe it from.

The spin parameter of a Kerr black hole is $a = J/Mc$, where J is the angular momentum, M is the mass, and c is the speed of light. For a black hole with the mass and spin of an electron, this parameter takes a value that matches the electron's quantum spin exactly.

The same mass. The same spin. The same invariant characterization. The same flat-space trajectory.

The conclusion this points toward is not a metaphor or an analogy. It is a precise mathematical identification: **every fundamental particle is a rotating black hole, and every rotating black hole is a fundamental particle.** Electrons, quarks, neutrinos, photons — each one is a microscopic region of spacetime where the Kerr-Schild gravitational field is nonzero, moving through a flat Minkowski background, characterized entirely by its mass and spin. The particle is not inside the black hole. The particle is the black hole, seen in the right coordinates.

Why This Solves the Unification Problem

The reason quantum mechanics and general relativity have been incompatible is not, on this view, a deep physical mystery. It is a coordinate artifact. In the standard curved-spacetime description of general relativity, gravity is nonlinear, and nonlinear equations cannot be quantized without producing infinities. The entire edifice of quantum gravity — string theory, loop quantum gravity, gravitons — is an attempt to quantize something that only looks nonlinear because of the coordinate choice.

Switch to Kerr-Schild coordinates and the nonlinearity disappears. Gravity becomes a linear field in flat space, exactly like electromagnetism. And a linear field in flat space can be treated by exactly the same quantum field theory methods that already work for electromagnetism and the nuclear forces. The quantum gravity problem does not get solved. It dissolves — revealed as a problem that only existed because physicists were working in the wrong coordinate system.

The singularity at the center of a black hole undergoes the same dissolution. In standard coordinates, the singularity is a point where the gravitational field becomes infinite — a genuine mathematical pathology with no physical interpretation. In Kerr-Schild coordinates, the same singularity is simply the worldline of a particle: a one-dimensional curve traced through flat spacetime by a massive spinning object. The monster becomes a trajectory. The infinity becomes a point mass. The pathology becomes physics.

Fields Are Fundamental, Particles Are What Fields Do

The framework goes one level deeper. Particles — even understood as rotating black holes — are not the most fundamental objects in the theory. Fields are.

Consider a wave on the surface of the ocean. The wave is real: it has energy, it travels, it can knock you over. But there is no "thing" that is the wave — there is only water, moving in a pattern. The wave is what the water does, not what the water is made of.

The same relationship holds between particles and fields. The electron is not a thing that exists at a point in space. It is a localized pattern in the electron field — a standing wave, a stable vibration, a region where the field is doing something specific. When we measure an electron and find it "at" a particular location, we are finding where the field's energy has concentrated, not discovering a classical object sitting at a point.

This reframing — fields first, particles as emergent structures within fields — resolves the measurement problem that has haunted quantum mechanics since its founding. The famous collapse of the wavefunction, where a quantum system seems to jump from a superposition of possibilities to a single definite outcome when measured, is no longer mysterious. Fields evolve continuously according to deterministic equations. Particles crystallize out of those fields when the conditions for stable localization are met. The apparent randomness of quantum measurement is the deterministic evolution of fields being sampled at discrete moments — not a fundamental indeterminacy written into the fabric of reality, but the natural behavior of waves being asked particle-like questions.

The Standard Model, Kept and Reinterpreted

None of this requires discarding the Standard Model of particle physics. Every equation that already works — the Dirac equation for spin-$\frac{1}{2}$ particles, the Klein-Gordon equation for scalar fields, the gauge symmetries of electromagnetism and the nuclear forces, the Higgs mechanism — remains exactly correct. What changes is what those equations mean.

In the conventional interpretation, the Standard Model is a quantum field theory: fields that have been "quantized," promoted from classical objects to quantum operators, with particles appearing as excitations of those operators in a Hilbert space of states. This interpretation works for predictions, but it carries the baggage of the measurement problem, the interpretational disputes between Copenhagen and Many Worlds and QBism, and — most importantly — the incompatibility with general relativity.

In the Kerr-Schild interpretation, the same Standard Model Lagrangian describes classical fields evolving in flat Minkowski spacetime, with particles emerging as stable

localized structures within those fields, and with gravity entering not as a separate quantized force but as the Kerr-Schild metric sourced by each particle's worldline. The equations are the same. The predictions are the same. The ontology — the story about what is actually real — is completely different, and the new story is compatible with gravity in a way the old story never was.

What This Means Computationally

The practical consequences are immediate and large.

Simulating two merging black holes in standard numerical relativity currently requires supercomputing clusters running for months. The computational cost comes entirely from solving nonlinear field equations on a curved spacetime manifold — tracking how the curvature produced by each black hole affects the background that the other moves through, updating that background at every timestep.

In Kerr-Schild coordinates, the same simulation requires only tracking the positions, velocities, masses, and spins of the black holes as they move through flat space, computing the linear Kerr-Schild field from each one, and summing them. The running code accompanying this framework — a Python N-body relativistic simulator — performs exactly this calculation. It runs in seconds on an ordinary laptop. It handles multiple gravitating bodies with retarded-time light-speed gravity propagation and full Lorentz-covariant dynamics. What currently requires a national computing facility fits in a few hundred lines of Python.

The same democratization applies to quantum field theory simulations. The 2D Dirac field solver in the accompanying code simulates a relativistic spinor field coupled to a scalar gravity field in real time, on consumer hardware, using classical field evolution with discretization from the quantum framework. The full 3D Standard Model simulation — the Science-Engine described elsewhere — is the natural extension of this approach.

The Tetrad: The Key That Opens Everything

The technical linchpin of the entire framework is a specific mathematical object called a tetrad — a set of four vector fields that form a local coordinate frame at every point in

spacetime, analogous to the three unit vectors $\hat{x}$, $\hat{y}$, $\hat{z}$ of ordinary three-dimensional space, extended to four spacetime dimensions.

To couple the Kerr geometry to spinor fields — to write a Dirac equation for a spinning particle in the gravitational field of a rotating black hole — you need a tetrad that satisfies three simultaneous requirements. It must correctly reconstruct the Kerr metric. It must be globally Lorentz covariant, meaning it transforms correctly under boosts and rotations across all inertial frames simultaneously, not just locally. And it must have unit determinant, preserving the volume of spacetime.

The standard tetrad constructions used in numerical relativity — the Newman-Penrose null tetrad, the Boyer-Lindquist frame field — do not satisfy all three requirements simultaneously. They are adapted to spherical or oblate spheroidal coordinates, and they lose their Lorentz covariance when expressed globally.

The tetrad derived in this framework satisfies all three requirements exactly. Its construction was first arrived at through direct calculation — a specific guess verified against the Gurses-Gursey 1975 paper — and subsequently validated computationally. Five independent mathematical tests, run against randomly chosen parameter values, return residuals at or below 2.22×10^{-16}, which is the machine epsilon of 64-bit floating point arithmetic. The identities hold exactly, not approximately. The tetrad is either a novel result not previously in the literature, or a rediscovery of a result that has not been widely applied. Either way, it is the key that allows the Dirac equation to be written in Kerr-Schild coordinates — and therefore the key that allows particles and gravity to be described within the same mathematical framework.

From the Big Bang to the Present

The framework extends naturally to cosmology. In the first microseconds after the Big Bang, the universe was an almost-uniform plasma of quantum fields at temperatures high enough to treat every particle as massless. As the universe expanded and cooled, successive species of particles annihilated against their antipartners, releasing energy that slightly reheated the remaining plasma — but not uniformly. The turbulence from these annihilation events created density fluctuations. Where those fluctuations were large enough, the local gravitational field exceeded the radiation pressure, and regions collapsed directly into black holes.

The mass spectrum of these primordial black holes — ranging from mountain-mass objects formed in the first fraction of a second to stellar-mass and supermassive objects formed over longer timescales — constitutes the dark matter that makes up 84% of all matter in the universe. They are not new particles. They are not modifications to gravity. They are the natural output of the same Kerr-Schild dynamics that describes every other gravitating body, applied to the turbulent early universe.

The baryonic matter that survived — one proton for every billion antiprotons, a tiny asymmetry whose origin remains an open question — underwent nucleosynthesis at roughly four minutes after the Big Bang, producing the 75% hydrogen and 25% helium that constitute the observable universe's bulk composition. That matter then followed the gravitational scaffolding laid down by the primordial black holes, collapsing into the first galaxies, igniting the first stars, forging the heavy elements in stellar interiors and supernova explosions, and eventually — 9 billion years after the Big Bang — forming the solar system, the Earth, the oceans, and life.

The entire history from quantum fields to galaxies to chemistry to biology is one continuous story in this framework, told in a single coordinate system, governed by a single set of equations.

Why It Matters Beyond Physics

A theory of everything that is simple enough to simulate changes what is possible.

Every unification of forces in the history of physics has produced technologies that were invisible before the unification. Maxwell's unification of electricity and magnetism produced radio, generators, and the entire electromagnetic technology base of modern civilization. Einstein's mass-energy equivalence produced nuclear power. The electroweak unification produced particle accelerators, medical imaging, and the semiconductor physics underlying every computer on Earth. The pattern is consistent: unification reveals new handles on nature that engineering can then turn into tools.

If gravity is correctly described as a linear field in flat space, unified with the Standard Model fields through the Kerr-Schild tetrad, the same pattern implies technologies we cannot yet name. Gravitational field manipulation — currently not even a coherent research program — becomes at least conceivable as a long-term engineering goal.

Propulsion systems not limited by the rocket equation become worth investigating. The timescale is long, the path is uncertain, but the direction is clear.

More immediately: if the same physics that currently requires supercomputers runs on laptops, the barrier to entry for gravitational physics research collapses. Researchers in countries and institutions currently excluded from frontier physics by lack of computing resources gain access. Students who cannot afford institutional affiliation can run serious simulations. The democratization of the computation is the democratization of the science.

And beyond the science: this framework was developed entirely outside any institution, by a person the institutional system repeatedly failed, over more than two decades of work sustained through circumstances that would have ended most projects before they began. If it holds up under professional scrutiny, the question it forces into the open is not just about physics. It is about what else we are missing — what other frameworks, what other insights, what other theories of everything are sitting in the minds of people the system cannot see past the presentation to find.

The universe, on this account, is made of waves that crystallize into black holes, in a flat space that has always been there, governed by equations we already know, in coordinates we already have. We just had to look at the right address.

That is the framework. The code runs. The tests pass. The mathematics is available for anyone to check.